THE NORTH AMERICAN BEETLES OF THE GENUS COCCINELLA

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The North American species of the genus *Coccinella* Linnaeus have been studied particularly by Casey (1899) and by Leng (1903). The results arrived at by these authors are, however, quite different. More than twice as many forms are recognized as separate species in the Casey revision as in the more recent survey of Leng. A new survey of the genus is, therefore, desirable. As shown by my studies (1925, 1926) on the palaearctic representatives of the genus *Coccinella*, the structure of the genitalia is a first-class character for the determination of the limits of the species in this genus. Consequently, the description of the genitalia is made the cornerstone of the present study.

A thorough comparison of the American species of *Coccinella* with Eurasiatic ones seems also very desirable. The genus *Coccinella* (limited as defined by me, 1925) inhabits chiefly the holarctic region. Only a few true *Coccinella* live outside of this region. If the holarctic fauna of this genus is properly understood, the world-wide revision of the genus may be easily accomplished.

The present study is based primarily on the examination of the collection of the United States National Museum, which was sent to me through the kindness of Dr. E. A. Chapin. Besides this, collections belonging to the following institutions and individuals were examined: American Museum of Natural History, Cornell University, University of Minnesota, Indiana University, Illinois State Natural History Survey, California Academy of Sciences (including collections of E. C. Van Dyke, F. E. Blaisdell, E. P. Van Duzee, and others), Citrus Experiment Station, F. W. Nunenmacher, A. H. Sturtevant, F. T. Scott, and P. H. Timberlake. I wish to express my gratitude to the owners and to the custodians of these collections for the privilege of examining their material.

The geographical distribution of the species of *Coccinella* is outlined here on the basis of the material personally studied by me. The localities are grouped in the sequence from east to west, and from north to south. The names of the collectors are indicated only for rare or little-known species and for especially interesting finds.

Genus COCCINELLA Linnaeus

Body more or less broadly oval, from moderately to very strongly convex. Head black, with a yellowish-white spot on each side near the eyes, or with a broad transverse white band across the front. Antennae longer than the diameter of the eye, with a compact club. Antennae and mouth parts dark brown or black, the base of the mandible frequently with a white spot; labrum brownish. Pronotum black with quadrangular or triangular white markings in the anterior angles, and in some species also with a white stripe along the anterior margin. Underside black, the episterna and the epimera of the mesosternum and metasternum white in some species. Prosternum with two carinae, which are slightly convergent anteriorly. Mesosternum not emarginate in the middle of the anterior margin. The coxal lines of the first abdominal sternite divided into two separate branches, one of which runs parallel to the posterior margin of the segment and the other directed toward the anterior angles. Legs black, tibiae with two spurs at the end, tarsal claws with a tooth at base. Elytra yellow, orange, or red with a variable black pattern. The elytral patterns of all the species and varieties of *Coccinella* may be represented as derivatives from the basic pattern consisting of six spots on each elytron (fig. 30). The first of these spots ($\frac{1}{2}$, the scutellar spot) lies on the suture at the scutellum and is common to both elytra; the humeral spot (1) lies at the humeral angles; the lateral spot (2) lies at one-third of the length of the elytron, near the external border; the discal spot (3) at two-fifths of the length of the elytron, closer to the suture than to the external border; the marginal spot (4) at two-thirds of the length of the external border, and the apical spot (5) at four-fifths of the length of the elytron, closer to the suture than to the external border. Among the American species only *Coccinella undecimpunctata* Linnaeus, some varieties of *C. johnsoni* Casey, and *C. transversoguttata* Falderman var. *nugatoria* Mulsant have the basic elytral pattern of the genus unchanged. In all other species some of the spots are either absent or confluent with others. Especially frequent is the fusion of spots 4 and 5 into a common apico-marginal spot (4+5). This fusion is frequently so intimate that the compound nature of the resulting spot may be not at all apparent.

Male genitalia.—The terminology of the parts of the genitalia of Coccinellidae proposed by Verhoeff (1895) seems to me preferable to

that used by other authors. The part functioning in Coccinellidae as a penis is, as shown by its development, homologous to only the proximal part of the penis of other Coleoptera (according to the unpublished data of the author). This part is termed the sipho (penis of other authors). Moreover, the penis, which is homologous to the distal part of the penis of other Coleoptera, is intimately fused with the basal plates (basal piece of other authors). The fingerlike paramera (lateral lobes) are articulated with the basal plates. The trabes (tegminal strut of other authors) is an unpaired chitinous rod articulated to the basal plates, and connected by muscles with the proximal end of the sipho.

In the genus *Coccinella* the sipho (*s*, fig. 1 and figs. 13–20) is hook-shaped. Its proximal end, in most species, is strongly chitinized and separated from the body of the sipho to form the so-called siphonal capsule (*sc*, figs. 1 and 13–20). Only in *Coccinella undecimpunctata* Linnaeus the siphonal capsule is rudimentary (fig. 20). The distal end of the sipho carries rather strongly developed praeputial sacs. The penis (*p*, figs. 1, 2–12) frequently possesses complicated processes on its distal end. The form of the penis is exceedingly variable and constitutes the best specific character. The trabes (*tr*, fig. 1) is relatively short and thick, and its free end has no clearly pronounced emargination. The basal plates (*bp*, fig. 1) are strongly developed. Paramera (*pa*, figs. 1, 2) are fingerlike and slightly compressed from the sides.

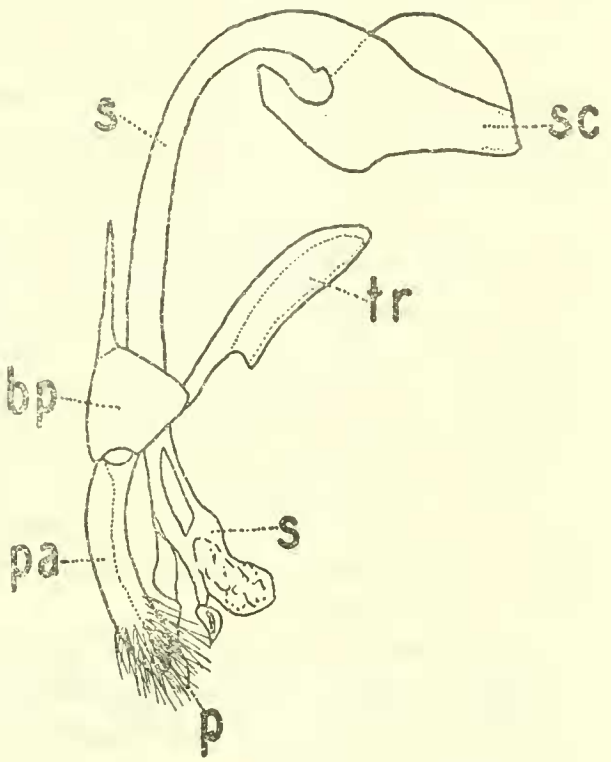


FIGURE 1.—Male genitalia of *Coccinella novemnotata* Herbst (lateral view). *bp*, Basal plates; *p*, penis; *pa*, paramera; *s*, sipho; *sc*, siphonal capsule; *tr*, trabes

Female genitalia.—The receptaculum seminis is large, mostly rather clearly differentiated into the cornu (*c*, figs. 22, 28), the nodulus (*n*), and the ramus (*r*). The sculpture of the walls of the receptaculum, consisting of chitinous rings, is well developed in all species except *Coccinella undecimpunctata* Linnaeus and its relatives. The infundibulum (*i*, figs. 22, 28) has a funnel-shaped dilatation on its anterior end and, in some species, a similar dilatation on its posterior end. The ductus receptaculi (*dr*, fig. 28) is very short and nearly hidden in the

funnel-shaped dilatation of the infundibulum. Some species have an accessory plate (Verhoeff's Anhangsplatte, loc cit.) attached to the posterior end of the infundibulum (*ap*, fig. 22).

COCCINELLA NOVEMNOTATA Herbst

Coccinella novemnotata HERBST, Natursystem der Käfer, vol. 5, p. 269, 1793.—CASEY, 1899, p. 88.—LENG, 1903, p. 198; 1920, p. 216.—JOHNSON, 1910, pp. 59–60.

Body subhemispherical. Head with a broad, undulate, yellowish-white band across the front, and with yellow anterior margin of the clypeus. Pronotum and pronotal epipleura with white subquadrate marks in the anterior angles, anterior margin of the pronotum more or less broadly white. Mesepimera and metepimera, the posterior ends of the metepisterna, and in males a spot on the anterior coxae and a stripe on the anterior femora, yellowish white. Head, pronotum, and elytra alutaceous, obscurely punctulate with the punctures somewhat stronger near the external margin of the elytra. Elytra yellow or orange, with nine black spots (½, 1, 2, 3, 4). The spot ½ moderate in size, triangular or rhomboidal, spots 1 and 2 small and usually rounded, spots 3 and 4 large in size and transversely elliptical in shape. The spots may fuse together or may be connected by rather slender black lines. The following patterns have been described: 1+2 (conjuncta Fitch), 3+5, ½+3, 2+1+3, 2+1+3+5 (confluenta Fitch). Length of body, 5.3–7 mm.

Male genitalia (figs. 2, 13).—Penis rather long and narrow, its proximal end extended in a triangular process. Paramera much shorter than penis. Basal plates broader than long. Sipho rather long and slender.

Female genitalia (fig. 21).—Cornu broad, ramus very small, nodulus conic in shape and thick-walled. Infundibulum short and thick, its posterior end dilated and surrounded by a ringlike furrow.

This purely American species seems to be related to the palaearctic species *Coccinella divaricata* Olivier (=*distincta* Redtenbacher). The points of similarity are the sculpture of the elytra, the shape of the elytral spots, and the shape of the sipho and the infundibulum. The form of the penis is, however, very different in these two species.

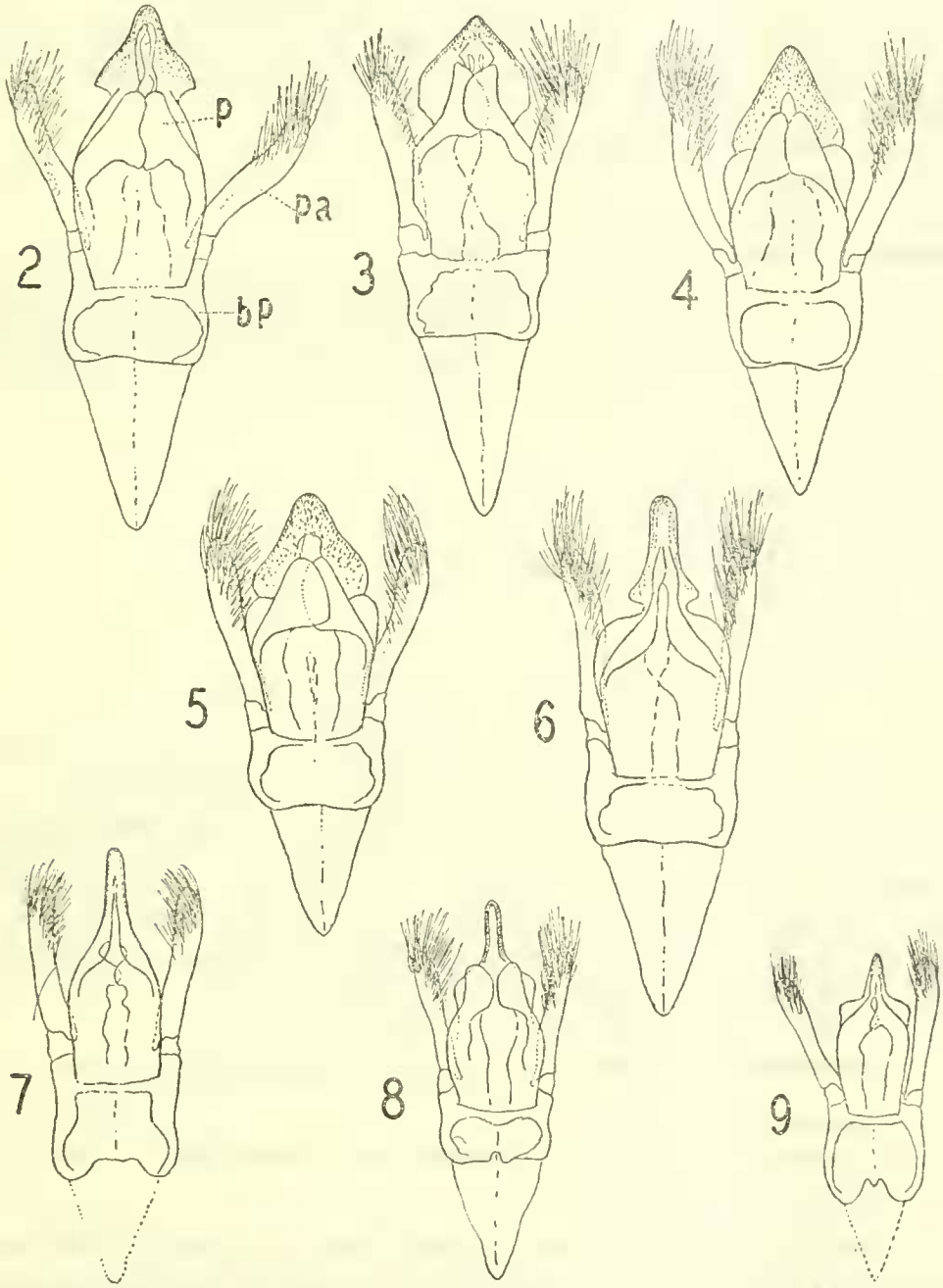
Geographic distribution.—Localities as follows:

Quebec: Montreal, Chelsea.
Ontario: Britannia.
New Hampshire: Lancaster, Mount Washington, Franconia, Wolfeboro.
Vermont: Ludlow.
Massachusetts: Melrose, Medford, Arlington, Stoughton, Springfield, Plymouth, Middleboro, North Saugus, Woods Hole, Falmouth, Truro, Siasconset, Oak Bluffs, Edgartown, Nantucket Island, New Bedford.
Rhode Island: Watch Hill.
Connecticut: Brookfield, Bridgeport.

New York: Black Mountain, Thousand Islands, Kinderhook, White Lake, New York, Farmingdale, Cold Spring Harbor, Riverhead, West Point, Ithaca, Forest Lawn, Honeoye Falls, Batavia, Dansville.

New Jersey: Fort Lee, Hackensack, Paterson, Passaic, Ramsey, Boonton, Newton, Mendham, Milltown, Lakehurst.

Pennsylvania: Philadelphia, Ashbourne, Glenside, Reading, Lehigh Gap, Gettysburg.



FIGURES 2–9.—Male genitalia of the different species of *Coccinella:* 2, *Coccinella novemnotata;* 3, *C. prolongata;* 4, *C. californica;* 5, *C. johnsoni;* 6, *C. transversoguttata;* 7, *C. nivicola;* 8, *C. suturalis;* 9, *C. difficilis.* In all figures the sipho and the trabes are not represented. *bp,* Basal plates; *p,* penis; *pa,* paramera

Delaware: Newark.

Maryland: Baltimore, Hagerstown, Odenton, Glen Echo, Riverdale.

District of Columbia: Washington.

Virginia: Falls Church, Vienna, Arlington, Fredericksburg, Bowling Green, Cuckoo, Richmond, Norfolk, Blue Ridge Mountains, Staunton, Afton, Peaks of Otter, Pennington Gap.

West Virginia: White Sulphur Springs.
North Carolina: Arcola, Southern Pines, Salisbury, Black Mountain.
South Carolina: Oswego, Batesburg, Beaufort.
Georgia: La Grange, Baconton, Moultrie, Thomasville.
Florida: State record.
Michigan: Whitefish Point, Marquette, Port Huron, Detroit, Douglas.
Ohio: Newton Falls, Salineville, Columbus.
Indiana: Knox, Culver, Nashville, Bloomington, Mineral.
Illinois: Chicago, Kankakee, Fulton, Oakwood, Urbana, St. Joseph, Champaign, White Heath, Charleston, Topeca, Havana, Dubois, Metropolis.
Kentucky: Campton.
Tennessee: Black Mountains, Coal Creek.
Alabama: Longview.
Louisiana: Tallulah, Mound.
Wisconsin: Waupaca, Madison, Osceola.
Minnesota: St. Paul, Minneapolis, High Prairie, Hennepin County, Lake Crystal, Minnehaha Creek, Lake City, Jordan, Shakopee, Rice County, St. Peter, Lesueur Center, Albert Lea, Owatonna, Mora, Brooten, Princeton, New London, Taylors Falls, Willow River, Houston County, Itasca Lake, Luverne, Ramsey.
Iowa: Muscatine, Ames.
Missouri: St. Louis, Utica, Willard.
Arkansas: Siloam Springs.
South Dakota: Madison, Black Hills.
Oklahoma: Hobart.
Texas: Dallas.
Wyoming: Carbon County.
Colorado: Boulder, Colorado Springs, Manitou, Rocky Ford.

Remarks.—In the individuals coming from the Eastern and Southern States the elytral spots are distinctly larger than in those from Minnesota, Missouri, and Iowa. Specimens from Wyoming and Colorado are intermediate between the typical *novemnotata* and the variety *degener* Casey (see below). Moreover, the frequency of specimens having confluent elytral spots is higher in Eastern and Southern States, and lower in the Middle West.

COCCINELLA NOVEMNOTATA Herbst subspecies DEGENER Casey

Coccinella degener CASEY, 1899, p. 88.
Coccinella novemnotata Herbst var. *degener* Casey, LENG, 1903, p. 198; 1920, p. 216.—JOHNSON, 1910, p. 59.

This race differs from the typical form by smaller size of the body, more polished surface of the elytra, and by smaller, sometimes absent, elytral spots. The genitalia of both sexes are not significantly different from those of the typical *novemnotata* Herbst. The geographic distribution of *degener* Casey gives a convincing evidence in favor of considering it as a subspecies of *novemnotata* Herbst, and not as a separate species. Length of the body, 4.8-6.2 mm.

Geographic distribution.—Localities as follows:

Saskatchewan: Carlyle.
Nebraska: Mitchell.
Kansas: Douglas County.
Oklahoma: Summit, Hobart.
Montana: Assiniboine, Bear Paw Mountains, Helena, Powderville, Broadwater County, Yellowstone County.
Wyoming: Big Horn Mountains, Canyon Camp (Yellowstone Park), Wheatland, Cheyenne, Carbon County.
Colorado: Pine Creek, Fort Collins, Greeley, Dixon, Boulder, Longs Peak (9,000 feet), Summit County, Golden, Denver, Florissant, Manitou, Colorado Springs, Rocky Ford, Buena Vista, Paonia, Salida.
New Mexico: Espanola, Santa Fe, Albuquerque, Koehler Junction, Coolidge.
Idaho: Moscow, Pocatello, Jerome, Twin Falls, Nampa.
Utah: Salt Lake City, American Fork, Saltair, Taylorsville, Murray, Holliday, Fort Douglas, Emigration Canyon, St. George.
Nevada: State record.
Arizona: Grand Canyon, Bright Angel, Williams, Flagstaff, Clemenceau.

Remarks.—The Middle West representatives are clearly intermediate between *degener* and the typical *novemnotata*. The variability of all the characters in which these subspecies differ from each other is very high in this region. On the other hand, many individuals from the western part of the distribution of *degener* have some of the spots on the elytra very small or missing. The subspecies *degener* is thus connected with the subspecies *oregona* Casey and *franciscana* Mulsant by a series of intergrades.

COCCINELLA NOVEMNOTATA Herbst subspecies OREGONA Casey

Coccinella novemnotata Herbst subspecies *oregona* CASEY, 1908, p. 403.—LENG, 1920, p. 216.

This subspecies is very close to *degener* Casey. It differs from it by the larger size of the body (equal to that of the typical *novemnotata* Herbst), by very dense but obscure punctation, and by very small and frequently missing elytral spots. The surface of the elytra is more polished than in either *novemnotata novemnotata* or *novemnotata degener*.

Geographic distribution.—Localities as follows:

British Columbia: Vernon, Midday Valley, Merritt, Nanaimo, Victoria, Departure Bay.
Washington: Fairfield, Pullman, Blue Mountains, Coulee City, Ritzville, Paha, Toppenish, Paradise Inn (Mount Rainier National Park), Olympia, Tenino.
Oregon: Wallowa Mountains, La Grande, Portland, McMinnville, Coast Range (Benton County), Corvallis, Klamath County, Amity.
California: Modoc County, Klamath Lake, Lassen County, Carrville, Plumas County, Mono County.

Remarks.—This subspecies occupies the northern Pacific States. In California it finds the southern limit of its distribution, and is connected by numerous intermediates with the more southern subspecies, namely *franciscana* Mulsant.

COCCINELLA NOVEMNOTATA Herbst subspecies FRANCISCANA Mulsant

Coccinella franciscana MULSANT, 1853, p. 19.
Coccinella californica CASEY (partim), 1899, p. 89; 1908, p. 404.
Coccinella novemnotata Herbst var. *franciscana* Mulsant, LENG, 1903, p. 198; 1920, p. 216.—JOHNSON, 1910, p. 59.

This race differs from other subspecies of *novemnotata* Herbst by the absence of all or most of the elytral spots, by the bright red of the elytra, and by the polished and shiny surface of the elytra. The individuals from southern California are usually spotless; those from San Joaquin Valley usually have a few of the spots characteristic for other subspecies of *novemnotata* Herbst. The *Coccinella* living in San Joaquin Valley may thus be considered intermediate between the subspecies *oregona* Casey and *franciscana* Mulsant. Casey (loc. cit.) considered *franciscana* Mulsant as a synonym for *Coccinella californica* Mannerheim. This view is unfounded. Even without consideration of the structure of the genitalia, the presence of the white margin of the pronotum in *franciscana* Mulsant is evidence against such a supposition.

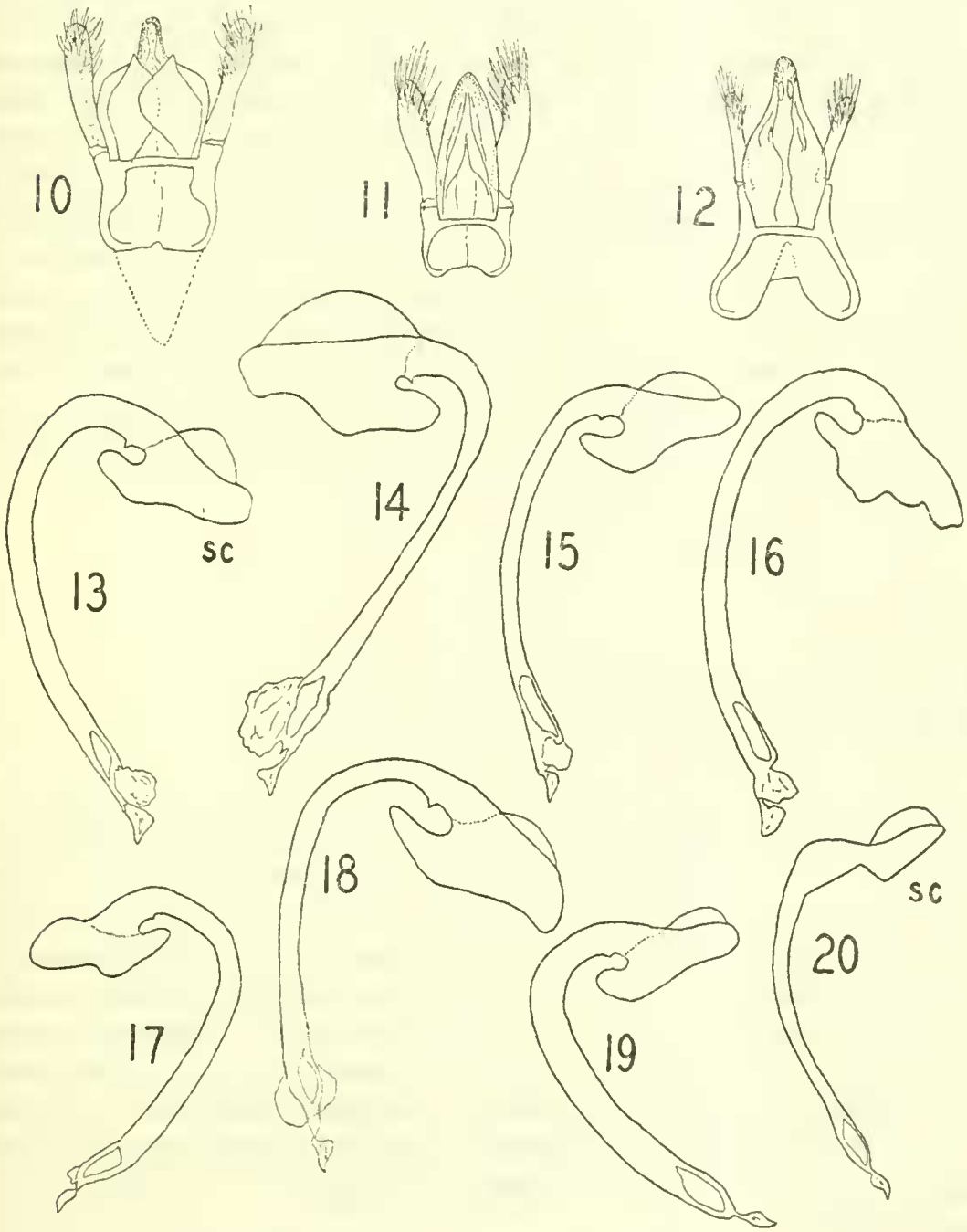
Geographic distribution.—Localities as follows:

California: Klamath Springs, Carrville, Oroville, Yuba County, Lake Tahoe, Truckee, Placerville, Mokelumne Hill, Valley Springs, Tuolumne County, Patterson, Fresno, Coalinga, Huntington Lake (7,000 feet), Independence, Visalia, Lemoncove, Lindsay, Bakersfield, San Fernando, Mint Canyon, Mount Lowe, Mount Wilson, Pasadena, Los Angeles, Whittier, Arcadia, Monrovia, Fish Canyon, Riverside, Balboa, San Diego, Coronado, Poway, Imperial County.
Utah: St. George.
Arizona: Yuma.
New Mexico: Espanola.

Remarks.—The distribution of *franciscana* Mulsant exhibits an interesting feature. This form is frequent in regions where *Coccinella californica* Mannerheim is absent, and is lacking or occurs only seldom in places where C. *californica* is frequent. Practically the only region where the distribution of the two species overlaps is the vicinity of Los Angeles. In general, *californica* occupies the region west of the Coast Range, while *franciscana* lives east of the Coast Range. Such a relationship seems typical for close species which are not far from being only subspecies of the same species. This is, however, hardly true in respect of *franciscana* and *californica*. Indeed, *californica* seems to be related closely to *transversoguttata* Falderman and not to *novemnotata* Herbst. On the other hand, *franciscana* is beyond doubt a subspecies of *novemnotata*. Perhaps the explanation of this peculiarity of distribution of the two species lies in some of their ecological peculiarities.

COCCINELLA PROLONGATA Crotch

Coccinella prolongata CROTCH, 1873, p. 371.—CASEY, 1899, p. 88.—JOHNSON, 1910, p. 64.
Coccinella transversoguttata Falderman var. *prolongata* Crotch, LENG, 1903, p. 199.
Coccinella monticola Mulsant var. *prolongata* Crotch, LENG, 1920, p. 216.



FIGURES 10-12.—Male genitalia of *Coccinella trifasciata*, *C. hieroglyphica*, and *C. undecimpunctata*, respectively. The sipho and the trabes are not represented.
FIGURES 13-20.—Sipho of the different species of *Coccinella:* 13, *C. novemnotata;* 14, *C. prolongata;* 15, *C. californica;* 16, *C. difficilis;* 17, *C. hieroglyphica;* 18, *C. nivicola;* 19, *C. trifasciata;* 20, *C. undecimpunctata.* *sc*, Siphonal capsule

More elongately oval than *C. novemnotata* Herbst, moderately convex, the sides of the elytra subparallel in the middle of their length, the convexity of the elytra very great in the posterior third of their length. Head black with very large white spots near the eyes, leav-

ing only a narrow black bridge between them. Mesepimera and metepimera, the posterior ends of the metepisterna, and, in the males, a spot on the anterior coxae, white. White markings in the anterior angles of the pronotum are extended toward the posterior angles and toward the middle of the disk, and, in most cases, are united by a narrow white stripe on the anterior margin of the pronotum. Anterior angles of the pronotal epipleura broadly white. Pronotum and the elytra alutaceous, rather densely and very finely punctulate, with punctures somewhat stronger than in *novemnotata* Herbst. Elytra yellow or orange with a large rhomboidal scutellar spot (½), a small round spot (2), a large obliquo-transverse spot (3), and a transverse spot in the apical third of their length (4+5), which sometimes is separated into two spots (4 and 5). Length of the body, 6.2–7 mm.

Male genitalia (figs. 3, 14).—Similar to those of *C. novemnotata* Herbst, but penis shorter, its sides angulate, the proximal end extended into a very broad, rhomboidal process. Basal plates wider than long. Sipho very large, the siphonal capsule developed more strongly than in any other species of *Coccinella.*

Female genitalia.—Unknown.

Geographic distribution.—Localities as follows:

Montana: Helena (W. M. Mann, collector).
Wyoming: Yellowstone National Park (W. Robinson, collector).
Kansas: State record (National Museum collection).
Colorado: Denver, Garland (National Museum collection).
Washington: Wenatchee (E. J. Newcomer, collector).

Remarks.—This species is rather closely related to *C. novemnotata* Herbst because of the structure of the genitalia, the punctation of the elytra, and the presence of the white spots on the anterior coxae in the males. I can not agree, therefore, with the opinion of Mr. Leng that *prolongata* Crotch is a variety of *nivicola* Menetries (*monticola* Mulsant). I find no characters indicating such a relationship except the pattern of the elytra, which is indeed similar to *C. nivicola* Menetries var. *alutacea* Casey. On the other hand, the genitalia of *prolongata* Crotch are quite sufficiently different from those of *novemnotata* Herbst to consider them separate species. The area of habitation of *prolongata* is completely included in that of *novemnotata.*

COCCINELLA PROLONGATA Crotch SEQUOIAE new subspecies

Similar to *Coccinella prolongata* Crotch but with the frontal spots smaller, with the quadrangular white spots in the anterior angles of the pronotum not dilated, elytra much more strongly punctate, intervals very finely alutaceous, reddish testaceous, elytral spots 3+2+4+5+3+½+3+5+4+2+3 confluent.

This race differs from the typical form in a rather large series of characters. The white markings on the pronotum are not extended

toward the posterior angles or toward the disk; the white stripe on anterior margin of the pronotum is missing. The mesepimera and metepimera are white, and the anterior coxae of the males have a white spot, as in *prolongata*. The convexity of the elytra is more regular than in *prolongata*, but less regular than in other species of *Coccinella*. The elytral spots are strongly increased in size and confluent with one another. Spots 2, 3, 4, and 5 form a ringlike pattern, which in most specimens is connected with spot ½. The elytral suture is red, at least in the posterior half of its length. The male genitalia are slightly different from those of the typical *prolongata*. The process on the distal end of the penis is somewhat longer and more pointed at the end; the sides of the penis are more rounded. In spite of all these differences, I consider this form a subspecies of *prolongata* rather than a separate species.

Geographic distribution.—Localities as follows:

California: Sequoia National Park, near Camp Wolverton (7,000 to 9,000 feet June 24–25, 1929, 51 specimens, E. C. Van Dyke, collector; ibidem, June 29, 1930, 2 specimens, T. Dobzhansky, collector; the type in the California Academy of Sciences collection).

COCCINELLA PROLONGATA Crotch subspecies BRIDWELLI Nunenmacher

Coccinella bridwelli NUNENMACHER, Ent. News, vol. 24, p. 76, 1913.—LENG, 1920, p. 216.

This subspecies is different from the typical form and from the subspecies *sequoiae* Dobzhansky by the smaller size and the less convex shape of the body, by the more strongly alutaceous surface, and the color of elytra. Elytra entirely black. The white markings on the head and the pronotum, and the punctation of the elytra, as in *sequoiae*. Mesepimera white, metepimera usually white, but in some specimens black (the type of *bridwelli*, according to Nunenmacher's description, has black metepimera). Three out of the five males studied had white spots on the anterior coxae. The genitalia not distinguishable from those of *sequoiae*. Length of body, 5.5–6.3 mm.

This is one of the three entirely black forms known in the genus *Coccinella*. It is more similar to the subspecies *sequoiae* than to the typical form. The subspecies *sequoiae* may be considered as an intermediate form between the subspecies *bridwelli* Nunenmacher and the typical *prolongata* Crotch.

Geographic distribution.—Localities as follows:

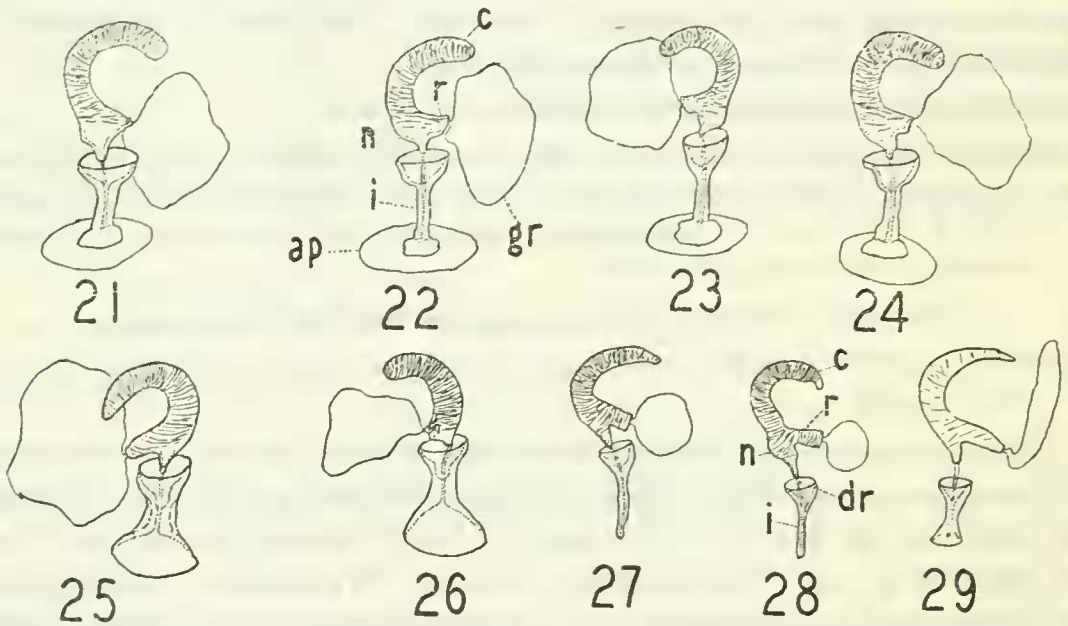
California: Tahquitz Valley (type and cotypes, J. C. Bridwell, collector), Tahquitz Canyon (E. C. Van Dyke, collector), Idyllwild (E. C. Van Dyke, collector).

COCCINELLA CALIFORNICA Mannerheim

Coccinella californica MANNERHEIM, Bull. Soc. Imp. Nat. Moscou, vol. 16, p. 312, 1843.—CASEY, 1899, pp. 88, 89.—JOHNSON, 1910, p. 62.

Coccinella trasversoguttata Falderman var. *californica* Mannerheim, LENG, 1903, p. 200; 1920, p. 216.

Body broadly oval, strongly convex. Head with a white spot on each side near the eyes, pronotum with a quadrangular mark in the anterior angles, pronotal epipleura with a narrow white margin. The variety *melanocollis* Casey has the whole pronotum black. Mesepimera white, metepimera black. Pronotum and elytra slightly alutaceous, densely but finely punctulate, the punctures becoming stronger toward the external margin of the elytra. Elytra bright red or orange with a black scutellar spot (½) and with a narrow black stripe along the suture. In some specimens the elytra are entirely red (var. *nevadica* Casey ?). Very seldom individuals occur having rudiments of the elytral spot 1, or the spot 3, or both. Length of the body, 5.4–6.5 mm.



FIGURES 21–29.—Receptaculum seminis and infundibulum of the different species of the genus *Coccinella:* 21, *Coccinella novemnotata;* 22, *C. californica;* 23, *C. johnsoni;* 24, *C. transversoguttata;* 25, *C. nivicola;* 26, *C. difficilis;* 27, *C. trifasciata;* 28, *C. hieroglyphica;* 29, *C. undecimpunctata. ap,* Accessory plate; *c,* cornu; *dr,* ductus receptaculi; *i,* infundibulum; *gr,* accessory gland of the receptaculum seminis; n, nodulus; r, ramus

Male genitalia (figs. 4, 15).—Penis slightly longer than the paramera, broadening distally, deeply emarginated in the distal half of its length, and extended into a very broad triangular process. Basal plates broader than long. Sipho shorter than in *C. transversoguttata* Falderman and in *C. novemnotata* Herbst.

Female genitalia (fig. 22).—Receptaculum seminis similar to that of *C. novemnotata* and *C. transversoguttata.* The infundibulum longer and more slender than in the species just mentioned.

This species is rather closely related to *C. transversoguttata.* This relationship is correctly recognized by Leng, but these species must be undoubtedly considered separate because of the difference in the structure of the genitalia, as well as in the external characters. I place *Coccinella nevadica* Casey as a synonym of *californica* Mannerheim with much hesitancy. I have not examined the Casey type

specimen, and the description of it is unsatisfactory. *C. nevadica* may also be a spotless variety of *C. nivicola* Menetries, or even may be synonymous with *C. novemnotata* Herbst var. *franciscana* Mulsant.

Geographic distribution.—Localities as follows:

British Columbia: Victoria, Nanaimo, Departure Bay.
Washington: Whatcom, Port Townsend, Seattle, Forks, Hoquiam.
Oregon: Astoria, Cannon Beach, Tillamook, Otter Rocks, Agate Beach.
California: Arcata, Samoa, Eureka, Scotia, Fortuna, Orick, Klamath, Sisson (J. Bradley collector), Chilcoot (Essig collector), Mendocino, Guerneville, Santa Rosa, Petaluma, Fairfield, San Rafael, Mount Tamalpais, Sausalito, Cazadero, Berkeley, Oakland, Alameda, Sacramento County (Citrus Experiment Station collection), Merced County (F.T. Scott collector), San Francisco, San Mateo, Redwood City, Palo Alto, Santa Clara, San Jose, Los Gatos, Santa Cruz, Morgan Hill, Salinas, Spreckels, Del Monte, Monterey, Pacific Grove, Carmel, Soledad, Pinnacles National Monument, King City, Lindsay (R. Jones collector), Guadalupe, Betteravia, Los Alamos, Lompoc, Santa Ynez, Santa Barbara, Santa Paula, Oxnard, Santa Monica, Mint Canyon, Saugus, San Fernando, Pasadena, Mount Wilson, Mount Lowe, Los Angeles, Arcadia, Monrovia, Fish Canyon, San Gabriel Canyon, Pomona, Whittier, San Pedro, Santa Ana, Balboa, Laguna Beach, San Juan Capistrano, Fall Brook, La Jolla, San Diego, El Cajon, Santa Rosa Island, Santa Cruz Island, San Nicolas Island (S. Emerson collector), San Clemente Island.
Lower California: Ensenada, Descanso Bay, Guadalupe Island.
Arizona: Senator (American Museum of Natural History collection).

Remarks.—One may conclude from the data presented above that *C. californica* is very common between the Coast Range and the Pacific Ocean, but occurs only very seldom between the Coast Range and the Sierra Nevada. It is the commonest species of *Coccinella* in the Los Angeles region, but seems to be entirely absent in the Mohave Desert. F. T. Scott informs me that *C. californica* is not found in the central part of the San Joaquin Valley, being replaced there by *C. novemnotata* Herbst var. *franciscana* Mulsant, which is not very common in the Los Angeles region. The finding of *C. californica* in Arizona and at Lindsay, Calif. (see above) seems to be very doubtful. It is probable that this species will be found also along the western coast of the northern part of Mexico.

COCCINELLA JOHNSONI Casey

Coccinella johnsoni CASEY, 1908, p. 403.—JOHNSON, 1910, p. 61.
Coccinella novemnotata Herbst. var. *johnsoni* Casey, LENG, 1920, p. 216.

Body more elongate and less convex than in *C. californica* Mannerheim. Punctulation of the pronotum and the elytra somewhat stronger than in the latter species. Elytra red with the 11 spots constituting the typical pattern of the genus *Coccinella* (fig. 30), and with a narrow black stripe along the suture. Spots 4 and 5 lie close to each other, and are frequently confluent. The black sutural margin may be absent; likewise spot 2, or spot 4, or both, may be absent. Spot

½ may be fused with spot 1 to form a transverse black fascia. Length of the body, 5.8–6.8 mm.

Male genitalia (fig. 5).—Resembling those of *C. californica*; but the process on the distal end of the penis shorter, broader, and less acuminate at the end.

Female genitalia (fig. 23).—Not distinguishable from *C. californica*.

This species is very close to *C. californica* but not to *C. novemnotata*, as suggested by Johnson and Leng. Its specific rank may be, however, a subject of dispute. Indeed, the very small differences in the structure of the genitalia and in the form of the body might make it questionable. No intermediates between the two species occur, however, in spite of the fact that the whole known distribution of *C. johnsoni* is included in that of *C. californica*. Notwithstanding the smallness of the differences between the two species, and the variability of the elytral pattern of *C. johnsoni*, they may be distinguished without difficulty. The species described by Casey (1908, p. 402) from northern Mexico, namely, *Coccinella sonorica*, is almost certainly a color variation of *C. johnsoni*.

Geographic distribution.—Localities as follows:

British Columbia: Victoria (California Academy of Sciences collection).
Washington: Orcas Island (W. M. Mann collector), King County (F. W. Nunenmacher collection).
California: Shively (E. O. Essig collector), San Francisco (F. T. Scott collector), Santa Paula, Pasadena, Fish Canyon, Santa Ana, Santa Monica, Costa Mesa, San Diego, Coronado, San Nicolas Island (S. Emerson collector), San Clemente Island (F. Blaisdell collector).

Remarks.—The individuals from British Columbia and Washington are rather considerably different from those from California in being less convex, in having the apex of the elytra acuminate, and in having very small elytral spots. This fact suggests that the species *C. johnsoni* is differentiated into two subspecies, one of which is living in British Columbia and Washington and the other living in California. It seems to be wise, however, not to propose Latin names to these subspecies until more material is available.

COCCINELLA TRANSVERSOGUTTATA Falderman

Coccinella transversoguttata Falderman, Mem. Soc. Imp. Nat. Moscou, vol. 4, p. 454, 1835.—Leng, 1903, p. 199; 1920, p. 216.—Johnson, 1910, pp. 61, 62.
Coccinella quinquenotata Kirby, Richardson's Fauna Boreali-Americana, p. 230, 1837.—Casey, 1899, p. 89; 1908, p. 401.
Coccinella transversalis Mulsant, 1850, p. 117.

Body broadly oval, very strongly convex. Head with a white spot on each side near the eyes, pronotum with white quadrangular marks in the anterior angles, pronotal epipleura narrowly white in the anterior angles. Mesepimera white, metepimera brown or black. Head, pronotum, and elytra densely and rather strongly punctulate, the

punctures becoming stronger toward the external margin of the elytra. Elytra yellow or red with a common black subbasal fascia (spots 1+½+1), a very small spot near the external margin (2), which is mostly absent in the American specimens (var. *quinquenotata* Kirby), a large transversely oval spot on the disk (3), and a subapical transverse fascia (spots 4+5). The subbasal fascia and spot 3 are reduced in the western specimens to narrow black stripes (var. *transversalis* Mulsant). Length of the body, 5.8–7.2 mm.

Male genitalia (fig. 6).—Penis longer than the paramera, rather wide, deeply emarginated in the distal half of its length, the distal end extended into a tonguelike process. Basal plates wider than long.

Female genitalia (fig. 24).—Receptaculum seminis similar to that of *C. novemnotata* Herbst, but shorter, wider, and with slightly thinner walls. Infundibulum also similar to that of *C. novemnotata*, but relatively longer and more slender.

Casey (1899) insisted on calling the American representatives of this species *quinquenotata* Kirby, and on restricting the name *transversoguttata* Falderman to the Asiatic representatives. I see no sufficient reason for such a separation, since the only difference between the American and the Asiatic representatives of this species is the frequent absence of spot 2 in the former. The absence of this spot is, however, observed also in Asiatic specimens, though as an exception, and its presence is sometimes observed in American individuals. The genitalia are completely alike in the American and in the Asiatic specimens (see Dobzhansky, 1926, fig. 1). Consequently, it seems superfluous to preserve the name *quinquenotata* Kirby even as a subspecific name.

Geographic distribution.—Localities as follows:

Nova Scotia: Truro.
Quebec: Montreal.
Ontario: North Bay, Ottawa, Toronto, Port Credit, Huntsville, Ridgeway.
Manitoba: Mile 214 on Hudson Bay Railroad, Winnipeg, Aweme.
Mackenzie: Great Slave Lake (National Museum collection).
Saskatchewan: Prince Albert, Carlyle.
Alberta: Calgary, Banff.
Alaska: New Rampart House (J. M. Jessup collector), Skagway (Harrington collector), Chitina Glacier (30 miles north of Mount St. Elias) (D. W. Eaton collector).
Yukon: Whitehorse (J. A. Kusche collector), Dawson (J. A. Kusche collector), White Pass (J. A. Kusche collector), Carcross (Harrington collector).
British Columbia: Vernon, Penticton, Merritt, Fort McLeod, Vancouver.
New Hampshire: Mount Washington, White Mountains, Lancaster, Franconia, Wolfeboro, Barnstead.
Massachusetts: Arlington, Boston, Cambridge, Forest Hills, Winchester, Truro, Woods Hole.
Connecticut: Bridgeport.
New York: Thousand Islands, Whiteface Mountain, Batavia, Ithaca, Honeoye Falls, West Point, Broadalbin.

New Jersey: Riverton.
Delaware: Wilmington.
Pennsylvania: State record.
Virginia: Fredericksburg.
Michigan: Whitefish Point, Marquette, Alpena, Daggett, Douglas.
Ohio: Lake County.
Illinois: State record.
Wisconsin: Waupaca, Winneconne.
Minnesota: Two Harbors, Duluth, St. Louis County, Itasca County, Beltrami County, Marshal County, Norman County, Otter Lake, North Branch, Taylors Falls, Ramsey County, Anoka, St. Paul, Minneapolis, Lake City, Lake Crystal, New London, Luverne.
Iowa: Muscatine, Crawford County.
Missouri: Belgrade.
North Dakota: Trail County, Binford, Fargo, Valley City, Drake, Oakdale, Bismarck, Mott.
South Dakota: Black Hills.
Texas: San Antonio, Colorado County.
Montana: Moccasin.
Wyoming: Big Horn Mountains, Cheyenne, Owl Creek Mountains, Cannon Camp (Yellowstone National Park), Paint Creek, Carbon County, Green River.
Colorado: Greeley, Pingree Park, Longmont, Boulder, Longs Peak Inn (9,000 feet), Golden, Denver, Grant, Rocky Ford, Fowler, Colorado Springs, Manitou, Canon City, Leadville (10,000 feet), Paonia, Grand Junction, Veta Pass, Garland, San Luis, Dark Canyon.
New Mexico: Chama, Aztec, Espanola, Las Vegas Hot Springs (7,000 feet), Chuska Mountains (8,800 feet).
Idaho: Moscow, Lewiston, Blackfoot, Pocatello, Jerome, Twin Falls, Boise.
Utah: Logan, Promontory, Huntsville, Kaysville, Coalville, Salt Lake City, Taylorsville, Kamas, Park City, Heber, Silverlake, Alta, Murray, Sandy, Lehi, West Jordan, Provo, Emigration Canyon, Fort Douglas, Price, Beaver Mountains (8,000–10,000 feet), St. George.
Arizona: Williams, Chiricahui Mountains.
Washington: Pullman, Ritzville, Paha, Coulee, Wenatchee, Toppenish, Seattle, Tacoma, Paradise Park (Mount Rainier, 6,000 feet).
Oregon: Baker, Cascade Rapids, Portland.
Nevada: Shell Canon (Ruby Mountains), Reno, Steamboat Springs, Lyon County, Esmeralda County.
California: Modoc County, Madeline, Truckee, Lake Tahoe, Mono County, Ryan (Dobzhansky collector).

This form is apparently lacking in southern California.

COCCINELLA TRANSVERSOGUTTATA Falderman subspecies NUGATORIA Mulsant

Coccinella nugatoria MULSANT, 1850, p. 1021.—CASEY 1908, p. 403.
Coccinella transversoguttata Falderman var. *nugatoria* Mulsant; LENG, 1903, p. 199; 1920, p. 216.—JOHNSON, 1910, p. 61.

This is a western subspecies of *C. transversoguttata* Falderman, differing from the typical form by smaller size, less convex elytra, finer punctation, and by the reduction of the pigmentation of the elytra. Spots ½ and 1 are separate, spot ½ is transversely oval or pyriform, spot 1 is round and small, spot 2 usually absent, spot 3 is smaller

and more narrowly oval than in *transversoguttata*, spots 4 and 5 frequently separate. Spot 1, or spot 4, or both, may be missing. Length of the body, 5.8–6.5 mm.

Casey (1899) insisted on granting a specific rank to *C. nugatoria* Mulsant. In fact it is only a rather indistinct subspecies of *C. transversoguttata* Falderman living in the Western States and in Mexico. An enormous area extending from North Dakota and New Mexico to the Pacific Ocean is inhabited by a mixed population in which all the intermediates between the typical *transversoguttata* Falderman and the typical *nugatoria* Mulsant may occur. Only in Mexico is the whole population *nugatoria*. The genitalia of *transversoguttata* (from Massachusetts) and of *nugatoria* (from California) are alike.

Geographic distribution.—Localities as follows:

Minnesota: Two Harbors, New London, Lake City.
North Dakota: Binford, Bismarck.
Wyoming: Cheyenne, Como, Carbon County.
Colorado: Pingree Park, Denver, Manitou, Leadville (10,000 feet), Vega.
New Mexico: Chama.
Idaho: Lewiston, Jerome, Boise, Nampa.
Utah: Ogden Canyon, Emery County, Taylorsville, Salt Lake City, Murray Park City.
British Columbia: Vernon, Penticton, Merritt, Vancouver.
Washington: Pullman, Toppenish, Tacoma, Wapato.
Oregon: Cascade Rapids.
Nevada: Carson City, Esmeralda County, Nixon.
California: Modoc County, Madeline, Nevada County, Big Pine.
Mexico: Queretaro, Mexico City, Guadalajara.

COCCINELLA NIVICOLA Menetries subspecies MONTICOLA Mulsant

Coccinella monticola MULSANT, 1850, p. 115.—CASEY, 1899, p. 89.—LENG, 1903, p. 198; 1920, p. 216.—JOHNSON, 1910, p. 63.
Coccinella lacustris LECONTE, Proc. Acad. Nat. Sci. Philadelphia, vol. 6, p. 131, 1852.
Coccinella impressa CASEY, 1899, p. 89; 1908, p. 402.

Broadly oval, strongly convex. Head with white spots near the eyes, pronotum with white quadrangular spots in anterior angles, pronotal epipleura with quadrangular marks or with only a white stripe in the anterior angles. Mesepimera white, metepimera brown or black. The sides of the pronotum frequently possess one or several impressions, which are variable in extent but which may be altogether lacking. Individuals with very strongly developed impressions on the pronotum were described by Casey (1899) as a separate species, *Coccinella impressa*. In a more recent paper, Casey (1908, p. 402) treated *impressa* as a subspecies of *monticola* Mulsant. The character is, however, only an individual variation, and in my opinion the name *impressa* must be treated simply as a synonym of *monticola*. Elytra

orange or yellow, alutaceous, punctation dense and strong, becoming stronger toward the external margin, with a very large pyriform scutellar spot (½), an oblique transverse fascia not attaining the suture or the external margin (spots 2+3), and with a large, transversally oval spot in the apical third (spots 4+5). Length of the body, 5.8–7 mm.

Male genitalia (figs. 7, 18).—Penis considerably longer than the paramera, slightly wider at the middle of its length than at the base, rapidly narrowing distally, the distal end extended into rather long fingerlike process. Basal plates longer than wide.

Female genitalia (fig. 25).—Receptaculum seminis short and wide, with ringlike sculpture on its walls rather delicate. Infundibulum short and thick, its posterior end with a funnel-shaped dilatation, the diameter of which is nearly twice as much as the diameter of the anterior dilatation of the infundibulum. Accessory plate absent.

I find *C. monticola* Mulsant not specifically distinct from the Asiatic species *Coccinella nivicola* Menetries. The typical *nivicola* (from eastern Siberia) differs from *monticola* in having the anterior fascia extended toward the humeral angles and in having a stronger punctulation of the elytra. Both characters are, however, variable. Individuals of *monticola* from Canada and the Northern United States have the elytral fascia very broad, and frequently extended toward the humeral angles. On the other hand, individuals of *nivicola* from southern Siberia, Mongolia, and Djungaria have the elytral pattern approaching that of *monticola*. Even more important is the fact that the genitalia of *nivicola* (see Dobzhansky, 1926, fig. 6) are identical with those of *monticola*. Thus, *monticola* must be considered a subspecific form of *nivicola*, equivalent to the subspecies *alutacea* Casey.

Geographic distribution.—Localities as follows:

Quebec: Quebec, Hudson Bay (University of Minnesota collection).
New Hampshire: Mount Washington, Lancaster, Franconia.
Michigan: Whitefish Point.
Minnesota: Duluth, Itasca Park.
Montana: Glacier National Park (T. Ulke collector), Missoula (National Museum collection).
Utah: Brighton (National Museum collection).
Colorado: Rogers Pass (Bradley collector).
Florida: State record (Illinois State Natural History Survey collection; this record is very doubtful).
California: Lassen National Park (8,000–10,000 feet, Dobzhansky collector), Tallac (A. Feneys collector), Fallen Leaf (California Academy of Sciences collection), Eldorado County (Blaisdell collector), Mono (Blaisdell collector):

Remarks.—The individuals from Montana, Colorado, and Utah are intermediate between *monticola* and *alutacea*. Those from California have the elytral pattern similar to that of *monticola* from New England, but one individual has the anterior fascia connected with the scutellar spot.

COCCINELLA NIVICOLA Menetries subspecies ALUTACEA Casey

Coccinella alutacea CASEY, 1899, p. 89.
Coccinella transversoguttata Falderman var. *alutacea* Casey, LENG, 1903, p. 200.
Coccinnella monticola Mulsant var. *alutacea* Casey, JOHNSON, 1910, p. 63.—LENG, 1920, p. 216.

Differs from the typical *nivicola* Menetries and from var. *monticola* Mulsant by the more strongly alutaceous surface of the elytra; the finer and sparser punctulation, and by the reduced pigmentation of the elytra. The shape of the body is less convex in *alutacea* than in *monticola*. The scutellar spot is rather small, the black fascia narrow, frequently disintegrating into a small round spot 2, and a large transversally oval spot 3. The apico-marginal spot (4+5) small, round or transversally oval. Spot 2, or spot 4+5, or both, may disappear (var. *biguttata* Johnson). Metepimera and the posterior ends of the metepisterna usually brown or yellow, though specimens having black metepimera also occur. The genitalia of both sexes are identical with those of typical *nivicola* and of subspecies *monticola*. Leng and Johnson were correct in not recognizing this variety as a separate species.

Geographic distribution.—Localities as follows:

Kansas: State record (Illinois State Natural History Survey collection).
South Dakota: Ardmore.
Montana: Assiniboine, Missoula, Yellowstone County.
Wyoming: Newcastle, Big Horn Mountains, Yellowstone National Park, Grand Teton National Park, Cheyenne, Green River (6,000–7,000 feet).
Colorado: Pingree Park, Fort Collins, Longmont, Boulder, Denver, Golden, Cimarron, Garden of the Gods, Manitou, Colorado Springs, Rocky Ford, La Veta, Leadville, Buena Vista, Paonia, Saguache.
New Mexico: Chama, Espanola, Santa Fe, Las Vegas Hot Springs, Elida, Albuquerque.
Idaho: Snake Canyon, Blackfoot, Burley.
Utah: Uinta National Forest, Alta, Salt Lake City, Silverlake, Murray, Heber, Logan, Emery County, Beaver Creek Hills, Iron County, St. George.
Arizona: San Francisco Mountains (7,900 feet) (Cornell University collection).
Nevada: Elko, Ely, Lovelock, Ormsby County, Nixon, Lamoille.
British Columbia: Fort McLeod, Vancouver, Victoria.
Washington: Sprague Lake, Toppenish, Paradise Park (Mount Rainier, 6,000 feet).
Oregon: Vale, Huntington, Lake County, Dallas.
California: Davis, Modoc County (California Academy of Sciences collection), Siskiyou County, Klamath (F. W. Nunenmacher collection), Lassen County (F. W. Nunenmacher collection), Plumas County (F. W. Nunenmacher collection), Madeline, Piedmont (F. W. Nunenmacher collector), Truckee (California Academy of Sciences collection), Bullfrog Lake (10,600 feet) (California Academy of Sciences collection).

Remarks.—Individuals from western Utah, Nevada, and California are characterized by an extreme reduction of the pigmentation of the elytra. Indeed, most of them have only spot 3 (var. *biguttata* Johnson), or only spot 5. Besides this they are usually smaller, less

convex, and more elongate-oval than the typical *alutacea* from more eastern localities. Perhaps this race deserves being called a separate subspecies, but more material is needed before its status can be established definitely. It must be noted that this very light race is recorded in the Sierra Nevada in nearly the same localities in which *monticola* Mulsant (see above) is recorded. In spite of this no intergrades between these very different races are so far observed. The genitalia of the Californian *alutacea* were studied and found to be not distinguishable from other specimens of *alutacea* or from *monticola*. The whole question certainly deserves further study.

COCCINELLA DIFFICILIS Crotch

Coccinella difficilis CROTCH, 1873, p. 370.—LENG, 1903, p. 200.—JOHNSON 1910, p. 64.
Coccinella monticola Mulsant var. *difficilis* Crotch, LENG, 1920, p. 216.
Coccinella vandykei NUNENMACHER, Ent. News, vol. 20, p. 161, 1909.
Coccinella transversoguttata Falderman var. *vandykei* Nunenmacher, LENG, 1920, p. 216.

Broadly oval, rather strongly convex. Head with white spots near the eyes, labrum brown, the anterior angles of the pronotum with quadrangular white marks, the anterior angles of the pronotal epipleura with a narrow white margin. Pronotum and elytra non-alutaceous, densely and finely punctulate. Elytra orange or red with a large scutellar spot (½), a small, round, frequently missing spot 2, a large, transversally elliptical spot 3, and a very large transverse apico-marginal spot (4+5), tending to break into two separate spots. Mesepimera and metepimera white. Length of the body, 5.4–6.3 mm.

Male genitalia (figs. 9, 16).—Penis only slightly longer than the paramera, gradually widening from the base in the distal direction, sharply narrowed at two-thirds of its length, and extended into a fingerlike process. Basal plates longer than wide. Sipho very long as compared with the size of the penis. Siphonal capsule angulate.

Female genitalia (fig. 26).—Receptaculm seminis short and wide; ramus rudimentary. Infundibulm similar to that of *Coccinella nivicola* Menetries.

This species is surprisingly close to *Coccinella tianshanica* Dobzhansky from middle Asia. The external structures as well as the genitalia are similar, though not identical, in the two species. They differ in the sculpture of the elytra, in the form of spot 4+5, in the form of the penis, and that of the receptaculum seminis. Among the American species of *Coccinella* the only close relative of *difficilis* is *C. suturalis* Casey. The two species just mentioned, and the Asiatic species *tianshanica* Dobzhansky and *iranica* Dobzhansky, form a separate section of the genus *Coccinella*. *C. nivicola* Menetries belongs,

however, to the group of species headed by the palaearctic species *C. septempunctata* Linnaeus. Though these two sections of the genus are related to each other, I can not agree with Leng, who places both *difficilis* Crotch and *suturalis* Casey as varieties of *nivicola* Menetries. *Coccinella vandykei* Nunenmacher is a synonym of *difficilis* Crotch.

Geographic distribution.—Localities as follows:

Montana: Helena (National Museum collection), Gallatin County (National Museum collection).
Wyoming: Cheyenne, Green River.
Colorado: Colorado Springs (National Museum collection).
Idaho: Bingham County, Pocatello, Jerome, Boise.
Utah: Salt Lake City, Beaver Valley, South Creek, Beaver County.
Nevada: Elko (H. F. Wickham collector), Lovelock (F. E. Blaisdell collector), Goldfield (Nunenmacher collector, type and two cotypes of *C. vandykei* Nunenmacher).
California: Chilcoot (Essig collector).

COCCINELLA SUTURALIS Casey

Coccinella suturalis CASEY, 1899, p. 89.—JOHNSON 1910, p. 64.
Coccinella monticola Mulsant var. *suturalis* Casey, LENG, 1903, p. 198; 1920, p. 216.

Elongate-oval, less convex than any other American species of *Coccinella*. Head and pronotum similar to *C. difficilis* Casey. Anterior angles of the pronotal epipleura with quadrangular white marks in females, and only narrowly white in males. Mesepimera white, metepimera black. Punctulation of the pronotum and of the elytra dense and strong, becoming much stronger toward the external margin of the elytra and toward the sides of the pronotum. Elytra orange, with a large, obcordiform scutellar spot (½), a rather broad black stripe along the suture, an oblique black fascia on the disk (spots 2 + 3), and a tranversal black spot in the posterior third of the length (spots 4 + 5). Length of the body, 5.5–5.8 mm.

Male genitalia (fig. 8).—Penis similar to that of *C. difficilis* Crotch, but considerably longer than the paramera, the distal process much longer and less pointed at the end. Basal plates wider than long. Siphonal capsule not angulate.

Female genitalia.—Unknown.

Coccinella suturalis Casey is related to *difficilis* Crotch, but differs from it in the shape of the body, in the punctulation and the pattern of the elytra, and in the structure of the genitalia.

Geographic distribution.—Localities as follows:

Utah: Alta (Hubbard and Schwarz collection).
California (Fresno County): Mount Kaiser (10,000 feet) (California Academy of Sciences collection), Mount Gould (12,000 feet) (California Academy of Sciences collection), Bubbs Creek (9,700 feet) (California Academy of Sciences collection).

COCCINELLA TRIFASCIATA Linnaeus

Coccinella trifasciata LINNAEUS, Systema naturae, p. 365, 1758.—LENG, 1903, p. 200.

Coccinella perplexa MULSANT, 1850, p. 1021.—CASEY, 1899, p. 89.—JOHNSON, 1910, p. 57.—LENG, 1920, p. 216.

Broadly oval, strongly convex. Head in females with white spots near the eyes, in males with a broad white stripe across the front. Pronotum with triangular or quadrangular white marks in the anterior angles, and with white anterior margin, pronotal epipleura with quadrangular white marks in the anterior angles. Mesepimera and metepimera, and usually also the posterior ends of the metepisterna, white. Pronotum densely and finely punctulate, punctures on the elytra nearly as dense as those on the pronotum but considerably stronger. Elytra yellow or orange with three transverse black fasciae; the anterior fascia is common to both elytra (it is the result of the fusion of the spots 1+½+1). The median fascia (spots 2+3), and the posterior fascia (spots 4+5) do not reach the suture or the external margin. Length of the body, 4.5–5.5 mm.

Male genitalia (figs. 10, 19).—Penis short and wide, pyriform in shape, its distal end extended into a short process. Paramera only slightly, if at all, shorter than penis. Basal plates not wider than long. Sipho very short and thick, the siphonal capsule rather small and rounded.

Female genitalia (fig. 27).—Receptaculum seminis long and slender, cornu almost pointed at the end, ramus wide, infundibulum not dilatated at the posterior end.

The American representatives of this species were described under the name *perplexa* Mulsant. The identity of *perplexa* Mulsant with the palaearctic species *trifasciata* Linnaeus was the subject of a dispute between Casey and Leng (see Casey, 1908). I find myself in a complete agreement with Leng, who regards *perplexa* as a mere synonym of *trifasciata*. The only difference between the American and the Eurasiatic specimens of this species is the presence of the white margin of the pronotum in the former. Johnson (1910) found an individual of *perplexa* having no white margin on the pronotum. Furthermore, this character is sometimes found also in Asiatic specimens (Dobzhansky, 1926). The genitalia of the American and the Asiatic specimens are quite alike (cf. Dobzhansky, 1926, fig. 10). It seems that *perplexa* can not be considered even as a subspecifically distinct form, and therefore the name should be dropped.

Geographic distribution.—Localities as follows:

Nova Scotia: Truro.
New Brunswick: Hampton.
Quebec: St. Hilaire, Lavaltrie, Fort Coulonge.
Ontario: Ottawa, Huntsville, North Bay, Toronto, Chatham, Hudson Bay (University of Minnesota collection).

Manitoba: Aweme, Mile 17 on Hudson Bay Railroad.
Alberta: Banff.
Alaska: Mountain Sheep Creek (22 miles below Eagle) (Harrington collector).
Yukon: Dawson (J. M. Jessup collector), Whitehorse (J. A. Kusche collector).
British Columbia: Glacier, Agassiz, Vernon, Victoria.
Maine: Orono, Boothbay, Casco Bay.
New Hampshire: Mount Washington, Lancaster, Franconia, Center Harbor, Farmington, Barnstead, Nashua.
Massachusetts: Boston, Arlington, Melrose Highlands, Princeton, Cambridge, Stoughton, West Medford, Middleboro, North Saugus, Falmouth, Woods Hole, Oak Bluffs.
Rhode Island: Watch Hill.
Connecticut: South Windsor, New Haven, Cromwell, Brookfield.
New York: Adirondack Mountains, Mount Whiteface, Mount McIntire, Newcomb, Wilmington, Lake Placid, Middletown, West Point, Larchmont, Pelham Bay, New York, Staten Island, Ithaca.
New Jersey: Fort Lee, Passaic, Ramsey, Great Notch, Newark, Westwood, Paterson, Chester, Boonton.
Pennsylvania: State record.
Maryland: State record.
Michigan: Whitefish Point, Alpena, Detroit.
Wisconsin: Madison.
Minnesota: Grand Marais, Two Harbors, Duluth, Itasca County, Roseau County, Minneapolis, St. Paul, Lake City, Beaver Dam, Lake Crystal, St. Antony.
North Dakota: State record.
Montana: Bear Paw Mountains, Columbia Falls.
Wyoming: Yellowstone National Park.
Colorado: Larimer County, La Veta.
New Mexico: Maxwell (National Museum collection).
Texas: State record (National Museum collection).
Idaho: Moscow, Ashton.
Utah: Logan (California Academy of Sciences collection).
Washington: Pullman.
California: Eureka, Klamath (Dobzhansky collector).

Remarks.—The individuals from Montana, Wyoming, Colorado, New Mexico, Idaho, and Utah are similar to those from the Northeastern States. A few individuals from Washington, Oregon, and California are probably extreme variants of the subspecies *subversa* LeConte.

COCCINELLA TRIFASCIATA Linnaeus subspecies SUBVERSA LeConte

Coccinella subversa LeConte, Proc. Acad. Nat. Sci. Philadelphia, vol. 7, p. 19, 1854.—Casey, 1899, p. 89.
Coccinella perplexa Mulsant var. *subversa* LeConte, Johnson, 1910, p. 57.—Leng, 1920, p. 216.

Differs from the typical *trifasciata* by the distinctly smaller size of the body and by a strong reduction of the black pigmentation of the elytra. Elytra spotless, or with only the scutellar spot ($\frac{1}{2}$), or with only a very small discal spot (3), or with both the scutellar and the discal spots. In any case, the size of the scutellar and the discal spots is very much decreased as compared with typical *trifasciata*,

the pigment is often brownish instead of black, and the outlines of the spots are frequently diffuse and indistinct. Length of the body, 4.3–5 mm.

According to Casey (1899, 1908) this is a species separate from *trifasciata* (*perplexa*). The opinion of Leng and Johnson seems to be, however, better founded. An investigation of the genitalia of a large series of specimens of *C. subversa* from Oregon failed to reveal any difference between it and the typical *C. trifasciata* from the Eastern States, except, perhaps, an insignificant difference in the absolute size. Thus, *C. subversa* may be classified as a good example of a subspecific form.

Geographic distribution. Localities as follows:

British Columbia: Agassiz, Vancouver, Wellington, Victoria.
Washington: Orcas Island, Mount Vernon, Everett, Port Angeles, Seattle, Tacoma, Puyallup, North Bend, Easton, Paradise Park (Mount Rainier), Longmire (Mount Rainier), Tenino, Oakville, Vancouver.
Oregon: Astoria, Agate Beach, Neskowin, Olney, Portland, Hillsboro, Forest Grove, Cannon Beach, Tillamook, McMinnville, Siuslaw National Forest, Wilsonville, Corvallis, Waldport, North Bend, Josephine County.
California: Scotia, Fortuna, Orick, Klamath, Hydesville, Sonoma County, Berkeley, Oakland.

Remarks.—As shown by the list of localities, the subspecies is abundant in Washington and Oregon, in the whole region between the Cascade Range and the Pacific Ocean. Its distribution extends to British Columbia, where it overlaps the distribution of the typical *C. trifasciata.* In the south the distribution of *subversa* overlaps that of the subspecies *eugenii* Mulsant and *juliana* Mulsant. It must be noted, however, that the individuals of *subversa* from California have the form of the body and the punctation of the elytra more similar to that of *juliana* than to that of *subversa* from Oregon and Washington. The parts of Oregon and Washington lying east of the Cascade Range are apparently inhabited by typical *trifasciata.* Thus the Cascade Range appears to be the line dividing the two subspecies.

COCCINELLA TRIFASCIATA, Linnaeus subspecies EUGENII Mulsant

Coccinella eugenii MULSANT, 1866, p. 95.
Coccinella trifasciata Linnaeus var. *eugenii* Mulsant, LENG, 1903, p. 200.
Coccinella perplexa Mulsant var. *eugenii* Mulsant, JOHNSON, 1910, p. 57.—LENG, 1920, p. 216.

This is a geographical race intermediate between the subspecies *subversa* LeConte and the subspecies *juliana* Mulsant. The size and the punctation of the elytra are as in *subversa.* The pattern of the elytra may consist of the three transverse fasciae similar to those of the typical *trifasciata* but much narrower and showing a clear tendency to disintegrate into separate spots. More frequently the intermediate fascia is broken into a small round spot 2 and an oblong,

transverse spot 3. The subapical fascia may also disintegrate into two small, usually round spots (4 and 5). Equally frequently the intermediate and the subapical fasciae remain intact, but the humeral fascia resolves itself into a round humeral spot (1) and a transverse scutellar spot (½). Finally, all the fasciae may disintegrate, resulting in a pattern similar to the typical pattern of the genus *Coccinella* (fig. 30). Some spots, especially 2, 4, and 1, may be absent.

Geographic distribution.—Localities as follows:

Oregon: Cannon Beach, Tillamook, Colestin.

California: Modoc County, Mount Shasta, Shively, Sisson, Cayton, Arcata, Eureka, Scotia, Fortuna, Orick, Klamath, Hydesville, Mendocino, Guerneville, Lagunitas, Fairfax, Albany, Alameda, Piedmont, San Francisco, Los Gatos, Napa County, Plumas County, Tallac, Tahoe, Half Moon.

Remarks.—The distribution of this subspecies overlaps that of the subspecies *juliana* Mulsant. The subspecies *eugenii* Mulsant is, however, more frequent in the northern part of California than in the San Francisco region. The reverse holds true for *juliana.*

COCCINELLA TRIFASCIATA Linnaeus subspecies JULIANA Mulsant

Coccinella juliana MULSANT, 1856, p. 135.—CASEY, 1899, p. 89.
Coccinella barda LECONTE, 1859, p. 286.
Coccinella trifasciata Linnaeus var. *juliana* Mulsant, LENG, 1903, p. 200.
Coccinella perplexa Mulsant var. *juliana* Mulsant, JOHNSON, 1910, p. 57.—LENG, 1920, p. 216.

More oblong but not less convex than other varieties of *C. trifasciata.* Punctation of the pronotum and of the elytra finer and sparser than in typical *trifasciata*; elytra shining. Pigmentation of the elytra strongly reduced. Usually only the humeral fascia is present, the two other fasciae being absent completely. The humeral fascia may resolve itself into separate spots (½ and 1). Small blotches of dark pigment may be present on the places occupied in other varieties by the spots 3, 4, and 5. Length of the body, 4.6–5.3 mm.

The genitalia of the subspecies *juliana* are not different from those of the typical *trifasciata* or from those of the subspecies *subversa* LeConte. This fact, as well as the absence of marked external differences, indicates that *juliana* is a geographical race of *trifasciata* and not a separate species. The geographic distribution of *juliana* is in accord with this view.

Geographic distribution.—Localities as follows;

California; Arcata, Hydesville, Scotia, Fortuna, Orick, Klamath, Dyerville, Shively, Casadero, Felton, Muir Woods, San Anselmo, Point Reyes, Fairfax, Sausalito, Muir Woods, Tiburon, Lagunitas, Mayfield, Napa County, Fieldbrook, Berkeley, Alameda, Piedmont, Contra Costa County, San Francisco, Millbrae, San Mateo, Mountain View, Crystal Lake, San Jose, Palo Alto, Los Gatos, Santa Cruz, Santa Cruz Mountains, Monterey, Carmel, Point Sal (T. Dobzhansky collector), Santa Paula, (P. H. Timberlake collection).

Remarks.—This subspecies is very common in the San Francisco region. To the north it gives numerous intergradations connecting it with the subspecies *eugenii* Mulsant (see above).

COCCINELLA HIEROGLYPHICA Linnaeus subspecies TRICUSPIS Kirby

Coccinella tricuspis Kirby, Richardson's Fauna Boreali-Americana, p. 231, 1837.—Casey, 1899, p. 90.—Leng, 1903, p. 201; 1920, p. 216.—Johnson, 1910, p. 59.

Body oval, more elongate than in other species of the genus *Coccinella*, strongly convex. Head with white elongate spots near the eyes, pronotum with quadrangular white marks in the anterior angles, the anterior margin of the pronotum usually white, pronotal epipleura with white quadrangular marks in the anterior angles. Mesepimera and metepimera black, mesepimera brownish only in fresh specimens. Pronotum densely and finely, elytra densely and strongly punctulate, elytra orange, with a common undulate subbasal fascia (spots 1+2+3+½+3+2+1), and with another transverse black fascia in the posterior half of their length (spots 4+5), not continuous across the suture. Length of the body, 3.7–4.3 mm.

Male genitalia (figs. 11, 17).—Penis short, sugar-loaf shaped, without processes or emarginations. Paramera short and thick. Basal plates wider than long. Sipho short and thick, siphonal capsule relatively very large.

Female genitalia (fig. 28).—Receptaculum seminis slender, cornu pointed at the end, ramus strongly developed. Infundibulum not dilatated at its posterior end.

I have shown (Dobzhansky, 1926) that the Siberian *Coccinella tricuspis* Kirby subsp. *mannerheimi* Mulsant is not specifically different from the European *Coccinella hieroglyphica* Linnaeus. This conclusion may be extended also to the American *tricuspis*. The genitalia of *C. tricuspis* Kirby (figs. 11, 17, 28) are completely like those of *C. hieroglyphica* (see Dobzhansky, 1926, fig. 4), and the external differences between these forms, involving the color pattern and the shape of the body, are by no means more extreme than those that are to be expected between geographic races. Thus, the species *C. hieroglyphica* inhabits the entire north of the holarctic region. The subspecies *C. hieroglyphica* lives in Europe and in western Siberia; *C. mannerheimi* occupies eastern Siberia; *C. tricuspis* occurs in Canada and northern United States; and *C. humboldtiensis* Nunenmacher inhabits the Pacific coast area of North America.

Geographic distribution.—Localities as follows:

Quebec: Quebec, Quinze Lake, Montreal.
Ontario: Lake Superior.
Manitoba: Aweme, Mile 17 on Hudson Bay Railroad.
Saskatchewan: Lebret.

Alberta: Province record.
New Hampshire: Lancaster, Mount Washington, Barnstead.
Michigan: Whitefish Point.
Minnesota: Two Harbors, Winton, Itasca Park, Minneapolis.
Montana: Bear Paw Mountains (National Museum collection).

COCCINELLA HIEROGLYPHICA Linnaeus subspecies HUMBOLDTIENSIS Nunenmacher

Coccinella humboldtiensis NUNENMACHER, Ent. News, vol. 23, p. 448, 1912.—LENG, 1920, p. 216.

Differs from *Coccinella hieroglyphica* Linnaeus subspecies *tricuspis* Kirby by less elongate form of the body, finer punctulation, and by reduction of the black pigmentation of the elytra. Elytra orange with a rhomboidal black spot ½ and without other spots, or with spots ½, 2, 3, and 4+5, or with ½, 4, and 5, or 4+5, or with two transverse fasciae (2+3 and 4+5), and the scutellar spot. Length of the body, 3.6–4.2 mm.

The genitalia of *C. humboldtiensis* (one male and one female were examined) are identical with those of *C. hieroglyphica tricuspis*. Nunenmacher (loc. cit.) correctly pointed out the closeness of *humboldtiensis* to *tricuspis*, but, in my opinion, overestimated the value of the differences discovered between them. Surprisingly enough, *humboldtiensis* possesses some similarities to the European *hieroglyphica*, which the geographically closer subspecies *tricuspis* does not possess. The similarities are the form of the body and the shape of the elytral markings.

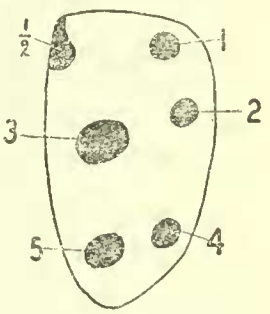


FIGURE 30.—Right elytron of *Coccinella undecimpunctata*, representing the spots constituting the typical pattern of the genus *Coccinella*. ½, Spot ½, or the scutellar spot; 1, the first, or humeral, spot; 2, the second, or lateral, spot; 3, the third, or discal, spot; 4, the fourth, or marginal, spot; 5, the fifth, or apical, spot

Geographic distribution.—Localities as follows:

Oregon: State record (Koebele collector).
California: Crescent City (F. W. Nunenmacher collector, type and cotypes), Plumas County (F. W. Nunenmacher collector), Siskiyou County (Koebele collector).

COCCINELLA UNDECIMPUNCTATA Linnaeus

Coccinella undecimpunctata LINNAEUS, Systema naturae, p. 366, 1758.—LENG, 1920, p. 216.

Oval, not strongly convex. Head with white spots near the eyes, pronotum and the pronotal epipleura with quadrangular or triangular white markings in the anterior angles. Mesepimera and metepimera white. Pronotum and elytra very densely and rather finely punctulate, elytra yellow or brick red with the 11 typical spots (fig. 30). Spots 2+3 and 4+5 fuse together forming two transverse fasciae (var. *boreolittoralis* Donisthorpe). Length of the body, 5–5.5 mm.

Male genitalia (figs. 12, 20).—This species may be recognized at once by the rudimentary, little chitinized siphonal capsule, and by the presence of a wide dilatation of the sipho just distal to the siphonal capsule. This dilatation is provided with an opening on the concave side of the sipho. Penis much longer than the paramera, basal plates much longer than wide, extended posteriorly into two divergent processes.

Female genitalia (fig. 29).—Receptaculum seminis long and slender, cornu pointed at the end, the ringlike sculptor rudimentary. Infundibulum short and provided with wide funnel-shaped dilatations at both ends.

Geographic distribution.—Localities as follows:

Massachusetts: Stoneham (F. A. Sherriff collector), Nahant (F. E. Blaisdell collector), Falmouth Heights (T. Dobzhansky collector).

Alaska: 4 miles north of New Rampart House (J. M. Jessup collector), 60–75 miles north of Rampart House (J. M. Jessup collector).

Remarks.—This species lives only along the sea coasts of Europe, on saline soils of Middle and Central Asia, and along the coast of the Polar Ocean from Greenland to the mouth of Yenisei. The finding of this species on the Massachusetts coast may be explained by two different hypotheses. First, it may have been introduced there from Europe. Second, it may be native there. In the latter case one may expect that it will be found also along the coasts of Nova Scotia, Newfoundland, and Labrador. The individuals from Massachusetts are quite similar to those from England and the northern coasts of Europe. The two individuals from Alaska are different from those from Massachusetts in appearance. They are larger, less convex, and have a stronger punctation. This seems to be a race the distribution of which is, as far as known, restricted to Alaska. It seems probable that *C. undecimpunctata* will be found also along the northern coast of eastern Siberia.

GEOGRAPHIC DISTRIBUTION OF SPECIES OF THE GENUS COCCINELLA

As shown above, the nearctic region is inhabited by 11 species of the genus *Coccinella*. In the palaearctic region there are at least 15 species of that genus. Six of the nearctic species are represented in this region by more than one subspecies. Furthermore, 5 species, as follows, live in both nearctic and in palaearctic regions: *transversoguttata* Falderman, *nivicola* Menetries, *trifasciata* Linnaeus, *hieroglyphica* Linnaeus, and *undecimpunctata* Linnaeus. All these species, except perhaps *undecimpunctata*, are widely distributed in northern and eastern Siberia, in Canada, and in the northern United States. Most of them are found also in Alaska, and it is very probable that all of them will be found there when the country is studied more

thoroughly. On the other hand, only one of these species—namely, *transversoguttata*—extends its distribution to the southern limits of both nearctic and palaearctic regions; that is to say, most of the species in common to both regions are distributed only in the northern part of the holarctic region. The accompanying table shows the subdivision of the genus into groups, and the correspondence between the nearctic and the palaearctic faunas.

Group	Nearctic species	Palaearctic species
novemnotata	novemnotata Herbst	divaricata Olivier.
	prolongata Crotch.	
transversoguttata	transversoguttata Falderman	transversoguttata Falderman.
	johnsoni Casey	
	californica Mannerheim	magnopunctata Rybakow.
septempunctata		septempunctata Linnaeus.
	nivicola subspecies monticola Mulsant	nivicola Menetries.
		reitteri Weise.
		saucerottei Mulsant.
difficilis	difficilis Crotch	tianshanica Dobzhansky.
	suturalis Casey	iranica Dobzhansky.
trifasciata	trifasciata Linnaeus	trifasciata Linnaeus.
		quinquepunctata Linnaeus.
	hieroglyphica subspecies tricuspis Kirby	hieroglyphica Linnaeus.
undecimpunctata	undecimpunctata Linnaeus	undecimpunctata Linnaeus.
		pontica Dobzhansky.
		miranda Wollaston.

The specific diversity of the genus *Coccinella* is concentrated, in North America, in the region between the Rocky Mountains and the Pacific Ocean. There is no species, except *undecimpunctata* L., that lives in North America, and that is not found in this region. East of the Rocky Mountains there are found only five species, and these are the species common to the nearctic and palaearctic regions (see above), i. e., the widely distributed holarctic species. As mentioned above, these species are chiefly northern in their distribution. Hence, the fauna of the southeastern United States is very poor. The only species found in this region is *novemnotata* Herbst. The presence of a clear center of the specific diversity in the nearctic region has no parallel in the palaearctic. Indeed, in the palaearctic one may point to at least two separate such centers; one in the region of Mongolia, Tsaidam, and Kuku-nor and the other in the mountains of Russian Turkestan (especially the Tian-Shan system) One may also note that all the species that are widely distributed in North America form separate subspecies in the regions lying west of the Rockies.

The second outstanding feature of the distribution of Coccinella is the decrease of the number of species from north to south. The fauna of Mexico, though very little known, is certainly poor. In the south the genus *Coccinella* is replaced by the closely related *Cycloneda* Crotch. The center of the specific diversity of *Cycloneda* lies in Central and South America, where it, and some related genera, replace *Coccinella* completely.

KEY TO THE SPECIES OF COCCINELLA

MALES

1. Head with a broad white stripe across the front ..... 2.
   Head black, with two white spots near the eyes ..... 3.
2. Anterior coxae with a white spot. Elytra never with transverse black fasciae. Penis extended into a triangular process, which is nearly as wide as long ..... **novemnotata.**
   Coxae black. Elytra frequently with transverse black fasciae. Penis extended into an acuminate process, which is much longer than wide ..... **trifasciata.**
3. Mesepimera and metepimera black. Penis without emarginations or processes, sugarloaflike in shape ..... **hieroglyphica.**
   At least the mesepimera white. Penis of a different shape ..... 4.
4. The siphonal capsule strongly chitinized. The sipho not dilated immediately beyond the siphonal capsule, and not provided in this region by a wide opening ..... 5.
   Siphonal capsule rudimentary, not more strongly chitinized than the rest of the sipho. Sipho strongly dilated immediately beyond the siphonal capsule, and provided with a wide opening. Mesepimera and metepimera white ..... **undecimpunctata**
5. Body little convex. Elytral suture with a broad black stripe. Penis extended into a fingerlike process, the sides of which are subparallel ..... **suturalis.**
   Body moderately to strongly convex. Elytral suture without or with a narrow black stripe ..... 6.
6. The sides of the penis deeply emarginated, its proximal part extended into a rhomboidal or triangular process ..... 7.
   The sides of the penis convergent distally, its proximal end extended into a more fingerlike process, acuminate at the end ..... 10.
7. Anterior coxae with a white spot. Convexity of the elytra very great in the posterior third of their length. Penis extended into a rhomboidal process ..... **prolongata.**
   Anterior coxae black. Convexity of the elytra regular. Penis extended into a triangular process ..... 8.
8. Penis extended into a process that is much longer than wide, the sides of this process strongly concave ..... **transversoguttata.**
   Penis extended into a broad triangular process, the sides of which are straight ..... 9.
9. Body convex. Elytra spotless ..... **californica.**
   Body moderately convex. Elytra spotted ..... **johnsoni.**
10. Body large, strongly convex. Penis gradually narrowing distally, extended into a long fingerlike process ..... **nivicola.**
    Body smaller, moderately convex. Penis abruptly narrowed distally, and extended into a short, acuminate process ..... **difficilis.**

FEMALES

1. Mesepimera and metepimera black. Infundibulum not dilated at its posterior end ..... **hieroglyphica.**
   At least the mesepimera white 2
2. Metepimera white ..... 3.
   Metepimera black or dark brown ..... 8.

3. Convexity of the elytra very great in the posterior third of their length ..... **prolongata.**
   Convexity of the elytra regular ..... 4.
4. Infundibulum not dilated on its posterior end. Elytra frequently with transverse black fasciae ..... **trifasciata.**
   Infundibulum dilated at both ends. Elytra usually without transverse black fasciae ..... 5.
5. Head with a broad white band across the front. Infundibulum dilated more strongly at the anterior than at the posterior end ..... **novemnotata.**
   Head with two white spots near the eyes. Infundibulum dilated equally at both ends, or with the posterior end dilated more strongly than the anterior ..... 6.
6. Infundibulum very short, equally dilated at both ends. Cornu pointed at the end, its ringlike sculpture rudimentary. Body little convex ..... **undecimpunctata.**
   Infundibulum very strongly dilated at its posterior end. Cornu not pointed ..... 7.
7. Body strongly convex. Elytra alutaceous .. **nivicola** subspecies **alutacea.**
   Body moderately convex. Elytra nonalutaceous ..... **difficilis.**
8. Body little convex. Elytral suture with a broad black stripe .. **suturalis.**
   Body moderately or strongly convex. Elytral suture without or with a narrow black stripe ..... 9.
9. The posterior end of the infundibulum dilated much more strongly than the anterior end, and not provided with a circular constriction ..... **nivicola.**
   The posterior end of the infundibulum provided with a circular constriction. Both ends of the infundibulum equally strongly dilated, or the anterior end more strongly dilated than the posterior ..... 10.
10. Elytra spotless ..... **californica.**
    Elytra spotted ..... 11.
11. Body strongly convex ..... **transversoguttata.**
    Body moderately convex ..... **johnsoni**

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